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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* HARIPRASAD SREEDHARAMURTHY,  
MOHSEN BANAN, and JOHN D. HOLDER

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Appeal 2009-0069  
Application 10/039,459  
Technology Center 1700

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Decided: December 24, 2008

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Before CHARLES F. WARREN, PETER F. KRATZ, and  
CATHERINE Q. TIMM, *Administrative Patent Judges*.

TIMM, *Administrative Patent Judge*.

DECISION ON APPEAL

I. STATEMENT OF THE CASE

Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's decision rejecting claims 1-14. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

The invention relates to a silicon single crystal pulling apparatus including structural components containing low iron content. Because the levels of iron are low in the apparatus components, less iron contaminates the single crystal grown with the apparatus (Spec. 1:9-16). Claim 1 is illustrative:

1. A crystal pulling apparatus for producing a silicon single crystal grown by the Czochralski process, the apparatus comprising:

a growth chamber; and

a structural component disposed within the growth chamber, the structural component comprising a substrate and a protective layer covering the surface of the substrate that is exposed to the atmosphere of the growth chamber, the substrate comprising graphite and having a concentration of iron no greater than about  $1.5 \times 10^{12}$  atoms/cm<sup>3</sup>, the protective layer comprising silicon carbide and having a concentration of iron no greater than about  $1.0 \times 10^{12}$  atoms/cm<sup>3</sup>.

Appellants request review of the Examiner's rejections maintained under 35 U.S.C. § 103(a). Specifically, the rejection of

(A) claims 1-9 as unpatentable over Holder (WO 99/66,108 pub. Dec. 23, 1999);

(B) claims 10 and 14 as unpatentable over Holder in view of Falser (US 5,919,302 issued Jul. 6, 1999) and Kim (US 5,942,032 issued Aug. 24, 1999); and

(C) claims 11-13 as unpatentable over Holder, Faster, Kim, and further in view of Luter (US 5,922,127 issued Jul. 13, 1999).

Appellants do not argue any claim apart from the others. Therefore, in accordance with 37 C.F.R. § 41.37(c)(1)(vii), we select a single claim as

representative for deciding the issues on appeal for each rejection. In fact, for each rejection, the issue is the same and is based on the contention that none of the prior art teaches or suggests structural components having the iron concentrations recited in claim 1 (also recited in claim 14, the other independent claim). Thus, we need only consider the issues as they apply to claim 1.

## II. DISPOSTIVE ISSUE

The dispositive issue on appeal is: have Appellants identified a reversible error in the Examiner's determination that it would have been obvious to one of ordinary skill in the art to select apparatus substrates and protective layers having iron impurity concentrations within the claimed ranges?

## III. PRINCIPLES OF LAW

One of the ways in which a claim's subject matter can be proved obvious is by establishing that there existed at the time of invention a known problem for which there was an obvious solution encompassed by the claims. *KSR Int'l v. Teleflex Inc.*, 127 S. Ct. 1727, 1742 (2007). It is well settled that “[t]he significance of evidence that a problem was known in the prior art is, of course, that knowledge of a problem provides a reason or motivation for workers in the art to apply their skill to its solution.” *In re Nomiya*, 509 F.2d 566, 572 (CCPA 1975). “[A] prior art reference must be ‘considered together with the knowledge of one of ordinary skill in the pertinent art.’” *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994) (quoting *In re Samour*, 571 F.2d 559, 562 (CCPA 1978)).

Purified products are not necessarily “obvious” within the meaning of 35 U.S.C. §103(a). *Aventis Pharma Deutschland GmbH v. Lupin, Ltd.*, 499 F.3d 1293, 1301 (Fed. Cir. 2007). However, if it is known that a desirable property will result from purifying a product, and the purification process is known in the art, purifying the product “is likely the product not of innovation but of ordinary skill and common sense.” *Id.*, quoting *KSR*, 127 S. Ct. at 1742.

Appellants and the Examiner attempt to apply “factors” from the case of *In re Cofer*, 354 F.2d 664 (CCPA 1966). The claims of *Cofer* were directed to free-flowing crystals of a compound known to be useful in the preparation of thermosetting epoxy resins. *Cofer*, at 664-665. Previously, the compound had been known to exist in a less-pure liquid state for the same use. *Id.* The court held it error to base an obviousness rejection solely on the fact that the utility of the purified product was the same as that for the prior art compound. *Cofer*, at 667. The court stated that the fact that a claimed compound has the same usefulness as a closely related compound may be an important consideration in determining obviousness, but is only one consideration. *Id.* Other factors must be weighed, namely, “whether the prior art suggests the particular structure or form of the compound or composition as well as suitable methods of obtaining that structure or form.” *Cofer*, at 668.

The factors of *Cofer* are factors particularly suited to the facts of that case. In other cases, certain factors may become unimportant while other factors rise in importance. Each case must be decided on its own facts.

#### IV. FINDINGS OF FACT

The following enumerated findings of fact ("FF") are of particular relevance:

1. It was recognized in the art that iron may outgass from graphite components used in a crystal pulling apparatus thereby contaminating the silicon melt and subsequently the grown crystal (Holder, p. 1, l. 30 to p. 2, l. 6).
2. Conventionally, iron outgassing was reduced by coating the graphite components with a protective barrier layer of silicon carbide. The silicon carbide seals the graphite surface (Holder, p. 2, ll. 17-36).
3. But coating with silicon carbide has not solved the problem. Iron in the graphite still penetrates the coatings, outgases, and contaminates the melt. In addition, the typical silicon carbide provided by industry is itself contaminated with about 1 ppm iron which can also contaminate the crystal. (Holder, p. 3, ll. 7-23.)
4. Holder's solution to the contamination problem involves adding silicon either within the silicon carbide coating or as a separate coating to act as a gettering sink to trap the iron contaminants before they outgass (Holder, p. 6, ll. 8-22).
5. Holder recognizes that the purity of the graphite is important. Holder describes using graphite that is generally at least about 99.9% or more pure graphite, preferably at least about 99.99%, and containing less than about 20 ppm total metals such as iron, molybdenum, copper, and nickel, preferably less than about 5 ppm of these metals (Holder, p. 7, ll. 10-16).

6. Holder recognizes that there is a relationship between the level of iron in the graphite and the level of contaminates outgassing from the graphite. As stated by Holder, “[g]enerally, as the purity of the graphite increases, the amount of particle generation during high temperature heating decreases.” (Holder, p. 7, ll. 16-18).
7. Appellant does not disclose any method for purifying either graphite or silicon carbide to the levels claimed (Spec. in its entirety).

## V. ANALYSIS

Holder provides evidence that the problem of iron contamination from the graphite and silicon carbide components of the crystal pulling apparatus was known in the art (FF 1-3). Holder also provides evidence that those of ordinary skill in the art understood that higher purity decreases the amount of outgassing particles of iron that would be able to contaminate the silicon crystal (FF 6). This known correlation provides a reason to purify graphite and silicon carbide to the lowest levels of iron contaminant possible to prevent iron outgassing. Therefore, if the purification process was known in the art, purifying the graphite and silicon carbide is likely the product not of innovation but of ordinary skill and common sense.

Here, there is no evidence that skilled workers were unable to purify graphite and silicon carbide to the claimed levels. In fact, Appellants do not themselves disclose a process for purifying these materials (FF 7). This provides evidence that processes for purifying to the claimed levels were known in the art. If, in fact, they were not, the claimed invention would lack enablement under 35 U.S.C. § 112, ¶ 1 as the Specification would not teach

the ordinary artisan how to obtain the purified products and, therefore, would not teach how to make and use the invention.

Appellants have not identified a reversible error in the Examiner's determination that it would have been obvious to one of ordinary skill in the art to select apparatus substrates and protective layers having iron impurity concentrations within the claimed ranges.

The Examiner relied upon Holder for the suggestions of purifying the graphite and silicon carbide components to the claimed levels. The other references were not relied upon to meet the limitations at issue. As Appellants have limited the scope of their arguments to the above issue and do not further contest the Examiner's rejections of the claims, we need not address the other prior art references at this time.

## VI. CONCLUSION

We sustain the following 35 U.S.C. §103(a) rejections of the Examiner:

- (A) claims 1-9 as unpatentable over Holder;
- (B) claims 10 and 14 as unpatentable over Holder in view of Falser and Kim; and
- (C) claims 11-13 as unpatentable over Holder, Faster, Kim, and further in view of Luter.

## VII. DECISION

The decision of the Examiner is affirmed.

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Application 10/039,459

VIII. TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal maybe extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

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